Genetically Engineered Mice for Heavy Chain Only Antibodies (HCAbs) Production

A novel approach to produce diverse, high-affinity heavy chain only antibodies (HCAbs) in genetically engineered mice.

Technology ID

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Technology

Dr. Koralov's lab established genetically engineered mice capable of producing heavy-chain only antibodies (HCAbs), similar to those naturally occurring in camelids. Unlike traditional methods that rely on camelid immunization or synthetic libraries, these mice are genetically modified to express single-chain antibodies resembling camel and alpaca-like antibodies. The modification enables the production of B cells with a diverse range of HCAbs that undergo natural affinity maturation and selection, thus overcoming the limitations of existing HCAb production methods.

Background

Traditional antibody production relies on both heavy and light chains, forming a Y-shaped structure. However, certain species like camelids and sharks naturally produce HCAbs, which lack the light chain and are smaller, more stable, and capable of reaching targets that conventional antibodies cannot access due to their superior tissue penetration. The genetically engineered mice used in this technology are a novel platform that mimics this natural HCAb production. These modifications are made directly in the endogenous immunoglobulin loci, allowing for the development of a diverse antibody repertoire and in vivo affinity maturation yielding high-affinity antibodies in response to various antigens.

Development Stage

Pre-clinical studies have demonstrated the ability of the genetically engineered mice to produce a broad repertoire of HCAbs with high specificity and affinity against a range of antigens, including viral proteins and tumor markers. Further studies are underway to evaluate their efficacy in therapeutic and diagnostic applications.

Applications

- Production of HCAbs that can be used in diagnostic assays for infectious diseases, including rapid tests for viral antigens.
- Rapid production of HCAbs for targeted cancer therapy, such as in the development of chimeric antigen receptor (CAR) T-cell therapies.
- Rapid production of HCAbs for use in biosensors and as biopharmaceutical agents.

Advantages

- The engineered mice produce HCAbs with enhanced affinity and specificity.
- Bypasses the need for camelid immunization and single domain antibody library screens, reducing costs and logistical challenges and leveraging *in vivo* affinity maturation.
- Generates a wide range of HCAbs for various applications, including therapeutics, diagnostics, and research.
- HCAbs can bind hidden protein epitopes that other antibodies cannot access.

Intellectual Property

US non-provisional patent pending.